

SHUBNIKOV, A. V.

"Piezoelectric Textures," Dok. AN, 45, No. 5, 1944. Cor. Mbr., Acad. Sci., Inst.  
of Crystalligraphy, ~~xxxxxx~~

SHUBNIKOV, ALEKSEY VASIL'YEVICH

Science

Atlas of crystallographic groups of symmetry. Moskva, Izd. Akademii nauk SSSR. 1946.

Monthly List of Russian Accessions, Library of Congress, September 1952. Unclassified.

SHUBNIKOV, A. V. Academician

Corresponding Member of Academy of Sciences of USSR

"Piezoelectric Textures" 1946

Soviet Source: N: Trud #133, Moscow, 7 June 1947

Abstracted in USAF "Treasure Island", on file in  
Library of Congress, Air Information Division,  
Report No. 63457

SHUBNIKOV, A. V.

"On the Law of Geometrical Selection in the Formation of a Crystal Aggregate," Dok. AN, 51, No. 9, 1946

CA

The multiplicity of elements of symmetry. A. V. Shubnikov. *Trudy Inst. Krist.* 1947, No. 3, 3-7; *Chem. Zvesti.* (Russian Zone Ed.) 1948, 1, 798.—Some of the crystallographic elements of symmetry to which characteristic symbols are assigned in the international system of nomenclature can be resolved into 2 simpler elements, as  $\bar{6} = 2 \times 3$  or  $\bar{6} = \bar{3} \times 2$ . It is recommended that only those "elements" that cannot be so resolved be designated as "elements of symmetry." M. G. Moore.

CA

The number of simple [crystal] forms of different designation. A. V. Shubnikov. *Trudy Inst. Krist.* 1947, No. 3, 9-10; *Chem. Zvesti.* (Russian Zone Ed.) 1948, 1, 706.--In the classification offered, which is based on external symmetry and the no. of vertexes, edges, and faces, there are 47 different types. M. G. Mironov

~~SHUBINKOV, A. V.~~

SHUBNIKOV, A V.

USSR/Acad Sci  
Crystals  
Magnets

Aug 1947

"June Session of Department of Physicomathematical Sciences" 1 p

"Vest Akad Nauk SSSR" No 8

Session convened 9 Jun, and first article read was by V. K. Arkad'yev, Corresponding Member of the Academy of Sciences, on resonance in molecular magnets. Among other articles read were those by A. V. Shubnikov, Corresponding Member of the Academy of Sciences, and Director of the Institute of Crystallography; N. V. Belov; G. G. Lemmleyn; etc. More research and study was suggested on the physics of crystals.

PA 5712

SHUBNIKOV, A. V. (Reviewer), G. M. Popov and I. I. Shafranovskiy

"Crystallography," (Moscow-Leningrad, State Geological Press, 1948) Reviewed by  
A. V. Shubnikov, Sov. Kniga, No. 5, 1948.



SHUBNIKOV, A. V.  
Belova, E. N., Belov, N. V., and Šubnikov, A. V. On the number and character of the abstract groups corresponding to the 32 crystallographic classes. Doklady Akad. Nauk SSSR (N.S.) 63, 669-672 (1948). (Russian)

It is well known that the 230 space groups contain 32 finite subgroups, one for each of the crystal classes. The authors have tabulated [with at least three misprints] the operations of these finite groups in terms of the central inversion  $C$ , reflection  $P$ , rotation  $L_n$ , rotatory reflection  $L_{2n}$  and rotatory inversion  $L_{2n}$  (so that the symbols  $L_n$  and  $L_{2n}$  are interchangeable). In this manner they show that certain sets of the groups are isomorphic, leaving eighteen distinct abstract groups:  $C_1, C_2 \sim C_2 \sim C_2, C_3, C_4 \sim S_4, V \sim C_{24} \sim C_{12}, C_6 \sim C_3 \sim C_{12}, D_2 \sim C_{12}, D_4 \sim C_8 \sim V_8, D_6 \sim C_6 \sim D_{12} \sim D_{24}, V_8, C_{24}, D_{24}, C_{24}, D_{24}, T, T_1, O \sim T_d, O_h$ . They might well have gone on to observe that these eighteen are direct products of eight basic groups, as follows:  $C_1, C_2, C_3, C_4, C_2 \times C_2, C_2 \times C_3, D_2, D_4, C_2 \times D_2, C_2 \times C_2 \times C_2, C_2 \times C_4, C_2 \times D_4, C_2 \times C_3 \times C_3, C_2 \times C_2 \times D_2, T, C_2 \times T, O, C_2 \times O$ . The basic groups are:  $C_n$ , defined by  $R^n = 1$  ( $n = 1, 2, 3, 4$ );  $D_n$ , defined by  $R^n = S^2 = (RS)^2 = 1$  ( $n = 3, 4$ );  $T$  and  $O$ , defined by  $R^n = S^2 = (RS)^2 = 1$  ( $n = 3, 4$ ). H. S. M. Coxeter.

Source: Mathematical Reviews,

Vol 10 No. 6

Corr. Mbr. AS USSR

SHUBNIKOV, A. V.

Quartz

Piezoelectric effect in quartz twins. Trudy Inst. krist., No. 5, 1949

Monthly List of Russian Accessions, Library of Congress, December 1952. UNCLASSIFIED.

SHUBNIKOV, A. V.

Shubnikov, A. V. On the symmetry of vectors and tensors. Izvestiya Akad. Nauk SSSR, Ser. Fiz. 13, 347-375 (1949). (Russian)

It is useful in crystallography to distinguish between the symmetry of geometrical figures and of "material" figures, which are figures with certain additional properties of a physical nature. There is, for instance, a difference in the symmetry of a cube with six white faces and a cube with five white faces and a black one. The crystal cubes of rock salt have the optical symmetry of ordinary spheres, but those of sodium chlorate that of spheres without symmetry planes but with a left or right orientation according to the rotation character of the plane of polarization. Since many physical phenomena in crystallography can be described with the aid of vectors and tensors the author proposes in this paper to establish the concept of the symmetry of vectors and tensors. Starting with the matrices  $a_{ij}$ ,  $i, j = 1, 2$ , which describe the different rotations and reflections in a three-dimensional system of orthogonal Cartesian axes, he systematically tests the symmetry properties of polar vectors, bivalent polar tensors, of axial vectors (bivalent polar tensors), and of bivalent axial tensors. The symbols to indicate the groups of symmetry are  $\infty$  for an axis of infinite order,  $\infty$  for a plane of symmetry and  $\infty$  for parallelism, etc. The notation will be clear from the following table indicating the symmetries of polar tensors.

Symmetry of the tensor	Form of the tensor	Situation of the axes
$\infty$	$\begin{Bmatrix} a_{11} & a_{12} & a_{21} \\ a_{21} & a_{22} & a_{32} \\ a_{31} & a_{32} & a_{33} \end{Bmatrix}$	arbitrary
$2//$	$\begin{Bmatrix} a_{11} & a_{12} & 0 \\ a_{21} & a_{22} & 0 \\ 0 & 0 & a_{33} \end{Bmatrix}$	axis 2 coincides with the $x_3$ -axis

Source: Mathematical Reviews,

Vol

No. 0

Can 1/1/2

SHUBNIKOV A. V.

Aug 51

USSR/Physics - Piezoelectrics  
Rochelle Salt

"Oscillations of Textural Piezoelectric Plates of Rochelle Salt Crystal," V. P. Konstantinova, A. V. Shubnikov

"Zhur Tekh Fiz" Vol XXI, No 8, pp 962-969

Shubnikov refers to his previous work (cf. "Iz Ak Nauk SSSR Ser Fiz" Vol VII, 166, 1944) in which he proved existence of piezoelec textures. Here authors describe studies of square and rectangular plates under elec excitation from a sonic generator. Authors thank V. F. Parnov for exptl work. Submitted 31 Jan. 51

PA 149T100

SHUBNIKOV, A. V.

USSR/Physics - Crystals, Isotropic and Anisotropic May 51

"Can a Crystal Be Simultaneously Isotropic and Anisotropic?" A. V. Shubnikov

"Uspekhi Fiz Nauk" Vol XLIV, No 1, pp 3-6

Considers notion that crystals may be isotropic relative to some properties and anisotropic relative to others or may be sym cube relative to some properties and sym sphere relative to others. Shows coexistence of apparently contradictory and exclusive properties such as discontinuity and continuity and isotropy and anisotropy, etc., in same crystal is

183T85

USSR/Physics - Crystals, Isotropic and Anisotropic (Contd) May 51

logically possible, despite reasonableness of doubts of some crystallographers. Argument is that different properties are relative and symmetries do not exist absolutely.

183T85

SHUBNIKOV, A. V.

PA 240T106

USSR/Physics - Reticulate Patterns

Dec 52

"Effects of Superposition of Reticulate Patterns,"  
A. V. Shubnikov

"Zhur Tekh Fiziki" Vol 22, No 12, pp 2038-2060

Describes previously known phenomena of formation of secondary magnified images of reticulate systems during superposition of two patterns and a number of other yet unknown phenomena of magnified patterns during superposition with perforated rasters. Clarification of phenomena and new laws are derived. Received 6 Sep 52.

240T106

1. SHUBENIKOV, A. V.
2. USSR (600)
4. Crystallography
7. Crystallography in the service of the national economy, Priroda, 41, No. 11, 1952.
9. Monthly List of Russian Accessions, Library of Congress, February, 1953. Unclassified.

SHUBNIKOV, A. V.

"The Development of Crystallography in the USSR," PRAVDA Article, May 21, 1953

Summary available in <sup>YELLOW Book</sup> ~~████~~ #99, 22 May 1953.



SHUBNIKOV, A.V.

Maxwell's law for optical anisotropic mediums. (In: Akademiia nauk  
SSSR. Voprosy petrografii i mineralogii. Moskva, 1953. Vol. 2,  
p.421-426) (MLBA 7:4)

1. Chlen-korrespondent Akademii nauk SSSR.

(Optics)

SHUBENIKOV, A.V.

**Physical Properties of Synthetic Corundum.** A Symposium (Fizicheskie Svoistva Sinteticheskogo Korunda). Edited by A. V. SHUBENIKOV, M. V. KLASSEN-NEKLYUDOVA, AND S. V. GRUM-GRZHMALLO. *Trudy Inst. Krig. Akad. Nauk S.S.S.R.* No. 8, 356 pp. (1953). Price R10.—The symposium was held in 1950 to give to the synthetic corundum industry a complete survey of the methods and results of scientific investigations, especially concerning optical and mechanical properties. The boule has been chiefly studied because an accurate knowledge of crystallographic orientation is the basis of every working process. The optical characteristics and structural properties of real (mosaic) crystals are therefore emphasized. The instruments used for the investigations are partly newly constructed and may be particularly recommended for studies of the physical properties of monocrystals other than those of synthetic corundum. References are given with each paper. Results of laboratory research on different properties of synthetic corundum crystals. S. V. GRUM-GRZHMALLO AND M. V. KLASSEN-NEKLYUDOVA. *Ibid.*, pp. 5-12.—The influence of impurities, e.g.,  $\text{Cr}_2\text{O}_3$ ,  $\text{MgO}$ ,  $\text{SiO}_2$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{V}_2\text{O}_5$ ,  $\text{CaO}$ ,  $\text{MnO}$ , and  $\text{CuO}$ , is discussed. Basic facts of the crystallography and structure of corundum crystals. E. S. RUDNITSKAYA. *Ibid.*, pp. 13-20. Thermal constants of  $\alpha\text{-Al}_2\text{O}_3$ . L. G. CHENTSOVA. *Ibid.*, pp. 21-26.—Thermochemical data are compiled. Properties of isomorphous mixes of  $\text{Al}_2\text{O}_3$  and  $\text{Cr}_2\text{O}_3$ . S. V. GRUM-GRZHMALLO. *Ibid.*, pp. 27-34.—The dimensions of the elementary cells and the fusion points of the crystalline solutions are given, together with data on densities and refractive indices, absorption spectra, and pleochroic phenomena.

Densities of synthetic corundum, especially the effects of crystalline solutions with  $\text{Cr}_2\text{O}_3$ . E. N. SLAVNOVA AND I. N. KONTN. *Ibid.*, pp. 35-40. Short review of the electrical properties of corundum. I. M. SOL'VISTKOVA. *Ibid.*, pp. 41-42.—Conductance as a function of temperature for white sapphire and the resistance of ceramic corundum bodies are discussed. Cr content of rubies. F. I. PASHKOVSKAYA. *Ibid.*, pp. 43-46.—Analytical data are given on the introduction of  $\text{Cr}_2\text{O}_3$  into synthetic corundum from  $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ , and special effects of small additions of  $\text{CaO}$  and  $\text{MgO}$  (from sulfates) on the color of rubies are described. Cr content of the batch and of synthetic ruby. A. A. KISELEV AND L. M. DOLGOVA. *Ibid.*, pp. 47-50.—The losses in  $\text{Cr}_2\text{O}_3$  from the batch to the powder and the finished ruby composition are discussed. Data on spectral analysis of corundum. S. V. GRUM-GRZHMALLO. *Ibid.*, pp. 51-55.—Domestic synthetic sapphires are compared with foreign products. The Russian samples are purer, containing less Fe, Cu, and Ca; foreign synthetic corundum products often contain Ti and V, and two samples showed Na. Only Cr and Mn are higher in domestic corundum products than in the foreign material. Measurement of the refractive indices of synthetic corundum and of corundum batches. N. M. MELANEKOLIN. *Ibid.*, pp. 57-76.—The immersion method of I. V. Obreimov (1919) for the determination of very small changes in refractive index is described. Problems of the heating of corundum batches. E. G. VALVASHKO, A. A. KISELEV, AND V. A. LITVINSKIY. *Ibid.*, pp. 77-88.—Special studies were made on the transition of  $\gamma\text{-Al}_2\text{O}_3$  formed from alum, to corundum with increasing temperature and time of heat exposure.

OVER

SHUBNIKOV, A. V.

"New Developments in Raser Optics," A.V.Shubnikov, Cor. Mbr., AS USSR, Priroda  
No 6, pp 20-25, Jun 53.

Describes a system of figures across a raster. Mentions the use of a raster-  
making instrument which was constructed by V.A.Shamburov. 261T99

SHUBNIKOV, A. V..

"Crystallography in the Service of the National Economy," listed among scientific publications in Prioroda, No. 11, Moscow, Nov, 1953, pp 77-80.

Shubnikov, A. V.

USSR.

The so-called homology of crystals. A. V. Shubnikov.  
Doklady Akad. Nauk S.S.S.R., 44, 1325 (1964).  
Abstr. 344, 935. — The symmetry elements can be reduced to  
translations and mirror-translation elements, and symmetry  
operations can be expressed in terms of linear orthogonal  
transformations of the type  $x_i = a_{ij}x_j$ , where the coefficients  
are direction cosines and  $a_{ij} = 0$  if  $j \neq i$ , and  $|a_{ij}| = 1$ .  
Homology operations can be described by the same type of  
transformation, but the coefficients need not be direction cosines  
and the above relations between them are not all true.  
Homology elements can be reduced to oblique reflections in  
planes. Although homology may be useful for describing the  
purely geometrical properties of lattices and external forms,  
the homology of real crystals does not exist. Applications of  
crystals have been based on an incorrect understanding of  
Podorny's law of limits, and deformation can only lower the  
symmetry of real crystals with phys. properties (cf. Mikhayev,  
C.A. 44, 92064, 44, 1325).

K. L. C.

SHUBNIKOV, A.V.

The Committee on Stalin Prizes (of the Council of Ministers USSR) in the fields of science and inventions announces that the following scientific works, popular scientific books, and textbooks have been submitted for competition for Stalin Prizes for the years 1952 and 1953. (Sovetskaya Kultura, Moscow, No. 22-40, 20 Feb - 3 Apr 1954)

<u>Name</u>	<u>Title of work</u>	<u>Nominated by</u>
Shubnikov, A.V.	"Symmetry and Antisymmetry of Finite Figures"	Institute of Crystallography Academy of Sciences USSR (2)

1954. 7 JUL 1954

SHUBNIKOV, A.V.

SHUBNIKOV, A.V.

An answer to L.A.Vardaniants' article "Revision of the cubic-  
octahedron twinning principle of alumo-potash alums." Izv. AN  
Arm. SSR Ser. FMET nauk 7 no.2:83-84 Mr-Apr '54. (MLRA 8:3)  
(Crystallography) (Alum)

SHUBNIKOV, A.V.

~~What is crystal homology?~~

What is crystal homology? Trudy Inst.krist. no.9:35-42 '54.  
(Crystallography, Mathematical) (MLBA 7:11)



SHUBNIKOV, A.V.

Corrections concerning the book "Symmetry and antisymmetry of  
finite figures." Trudy Inst.krist. no.9:383 '54. (MLRA 7:11)  
(Crystallography) (Shubnikov, A.V.)

SHUBNIKOV, A.V.

"Asymmetry of Terminal Figures." by A.V. Shubnikov, pp. 799.

SO: Works of the Inst. of Crystallography, Issue #10, (Reports submitted at  
at the 3rd International Congress of Crystallography; published by the  
Acad Sci USSR, Moscow, 1954)

SHUBNIKOV, A.V., deystvitel'nyy chlen.

Examples of the use of the idea of antisymmetry in science. Zap.

Vses.min.ob-va 83 no.1:5-10 '54.

(MLRA 7:4)

(Symmetry)

~~SHUBNIKOV, A.V.~~

A traditional error and the various forms in which it occurs.  
Zap.Vses.min.ob-va 83 no.4:408-413 '54. (MLRA 8:2)  
(Crystallography)

SHUBNIKOV, A.V., akademik; ZHELUDEV, I.S.; KONSTANTINOVA, V.P.;  
SIL'VESTROVA, I.M.; TOLKACHEV, S.S., redaktor; ARONS, R.A.  
tekhnicheskiiy redaktor.

[Research on piezoelectric crystal patterns] Issledovanie  
p'ezoelektricheskikh tekstur. Moskva, Izd-vo Akademii nauk  
SSSR, 1955. 188 p. (MLRA 8:9)  
(Piezoelectricity)

SHUBNIKOV, A.V.

Possible and impossible structural modifications of the diamond.  
Trudy Inst.krist. no.11:5-17 '55. (MIRA 9:6)  
(Diamonds)

Shubnikov, A. V.

USSR/Solid State Physics - Solid State Theory. Geometric Crystallography, E-2

Abst Journal: Referat Zhur - Fizika, No 12, 1956, 34578

Author: Shubnikov, A. V.

Institution: None

Title: On the Fundamental Law of Crystallography of Ye. S. Fedorov

Original Periodical: Tr. In-ta. kristallogr. AN SSSR, 1955, No 11, 18-32

Abstract: Based on examples with known crystal structures, the hypothesis predicted by Fedorov that all crystals consist of identical parallel-arranged particles is subjected to a critical examination. Fedorov drew this conclusion by identifying the parallelohedra with "crystalline molecules," which is not true in general. Ye. S. Fedorov's attempt (after discovery of x-ray-diffraction analysis) to save the plausibility of the "basic law of crystallography" by introducing the concept of the "fundamental parallelepiped" was unsuccessful. Also unsuccessful are the still-continuing efforts undertaken by some of his students to retain Ye. S. Fedorov's incorrect premises. The author indicates the tremendous value of all the basic works by Ye. S. Fedorov to the development of crystallography. He also subjects to criticism those investigations of Fedorov and his students, involving the so-called "basic law of crystallography."

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"APPROVED FOR RELEASE: 08/09/2001

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SHUBNIKOV, A. V.

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APPROVED FOR RELEASE: 08/09/2001

CIA-RDP86-00513R001550120006-1"



SHUBNIKOV, A.V., deystvitel'nyy chlen.

Determination of the concept of crystalline homogeneity. Zap.

Vses.min.ob-va 84 no.1:110-114 '55.

(MIRA 8:5)

(Crystallochemistry)

SHUBNIKOV, A.V., deystvitel'nyy chlen.

Absence of specific association between homologies of external forms of crystals and homologies of indicatrices of physical characteristics of crystals. Zap.Vses.min.ob-va 84 no.1:121-122 '55.

(MIRA 8:5)

(Crystallography)

SHUBNIKOV, A. V. Acad

"Crystals in Science and Technology," Acad Sci USSR, 1956

Describes the successes of crystallography. The author reports on the work carried out in the AS USSR Inst. of Crystallography which he directs. Here several crystals which play a very important part in technology are produced artificially.

Yellow book, CC 12, 2 Mar 56

21. Shubnikov, Aleksel V.: Kristally v Nauke i Tekhnike  
(Crystals in Science and Technology). Moscow: Izdatel. *Chernom*  
Akad. Nauk S.S.S.R. 1950. 48 pp.

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E-2

USSR / Theory of Solids. Geometrical Crystallography.

Abs Jour : Ref Zhur - Fizika, No 4, 1957, No 9155

Author : Shubnikov, A.V.

Inst : Institute of Crystallography, Academy of Sciences USSR

Title : Certain Features of Thermal Deformation of Crystals.

Orig Pub : Kristallografiya, 1956, 1, No 1, 95-104

Abstract : It is proven that the thermal expansion of crystals cannot be reduced to merely a simple elongation over all directions, drawn through some point taken inside the crystal. The correct picture of thermal deformation of crystals is given by the diagram in which the unit radii of the sphere OA are transformed into radius vectors of the ellipsoid OB with the aid of the displacement vectors AB (see diagram). With this, the coefficients of thermal expansion of the crystals are assumed to be the segments AC rather than the segments AD. The dependence of the coefficient of expansion of the crystal on the direction is given by the formula  $\alpha' = \alpha_1 c_1^2 + \alpha_2 c_2^2 + \alpha_3 c_3^2$

Card : 1/2

SHUBNIKOV, A.V.

Absence of a definite connection between the homologies of external crystal forms and the homologies of their optical indices. Kristallografiia 1 no.2:246-247 '56. (MLRA 9:11)

1. Institut kristallografiia Akademii nauk SSSR.  
(Crystallography)

SHUBNIKOV, A.V.

USSR / Morphology of Crystals. Crystallization.

E-7

Abs Jour : Ref Zhur - Fizika, No 4, 1957, No 9382

Author : Shubnikov, A.V.

Inst : Institute of Crystallography, Academy of Sciences USSR

Title : Features of Crystallization of Diphenylamine.

Orig Pub : Kristallografiya, 1956, 1, No 3, 374-375

Abstract : Description of the radially emerging individual crystals ("spherulites") which are obviously not of spherical shape, and which are obtained upon crystallization from a fused mixture of diphenylamine with tarry substances added. There occurs as a result of the branching of the needle-like single crystals of the nuclei with formation of "bifoliate" inside each unit. A procedure is described for preparing the compounds. It is proposed to call the thin radially-emerging formations, occurring from the single-crystal or twin nucleus, "spherocrystals" to distinguish them from polycrystalline spherulites, which are produced by many nuclei.

Card : 1/2

SHUBNIKOV, A. V.

✓ Lecture experiment for demonstrating the rhythmic growth of crystals of salol. A. V. Shubnikov (Inst. Cryst., Acad. Sci. U.S.S.R., Moscow). *Kristallografiya* 1, 600-7 (1956).— A cross is ruled on a microscope slide with a drawing pen dipped in molten salol. The surface of the slide is lightly etched beforehand. The slide is warmed and then cooled so that the salol is slightly supercooled. The end of one arm of the trace of salol is inoculated to start crystal, which proceeds rhythmically up to the junction and then continues out along the 3 other arms of the cross. The demonstration can be projected if protected from the heat of the lantern.

A. L. Mackay



SHUBNIKOV, A.V., akademik.

Crystals in science and technology. Vest. AN SSSR no.3:37-52  
Mr '56. (Crystallography) (MLRA 9:6)

Category : USSR/Solid State Physics - Solid State Theory. Geometric E-2  
Crystallography

Abs Jour : Ref Zhur - Fizika, No 3, 1957, No 6504

Author : Shubnikov, A.V.

Title : Concerning One Interesting Remark by the Editor

Orig Pub : Tr. In-te kristallogr. AN SSSR, 1956, vyp. 12, 205

Abstract : See Referat Zhur Fizike, 1955, 19027

Card : 1/1

SHUBNIKOV, A.V. (Moskva)

Problems on electrostatics. Fiz. v shkole 16 no.2:79 Mr-Ap '56.  
(Electrostatics) (MLRA 9:6)

SHUBNIKOV, A.V., akademik.

Crystals in science and technology. Priroda 45 no.4:9-23 Ap '56.  
(Crystals) (MIRA 9:7)

SHUBNIKOV, A.V.

CARD 1 / 2

PA - 1503

SUBJECT USSR / PHYSICS  
 AUTHOR ŠUBNIKOV, A.V.  
 TITLE On the Works by PIERRE CURIE dealing with Problems of Symmetry.  
 PERIODICAL Usp.fis.nauk, 59, fasc.4, 591-602 (1956)  
 Issued: 10 / 1956 reviewed: 11 / 1956

According to the author's opinion CURIE'S works on symmetry are hardly less important than those on radioactivity. PIERRE CURIE was the first to point out the particular importance of those symmetry groups which are now referred to as "groups which are punctiform in the limiting value". The 7 groups concerned are enumerated and described in short. With the help of these symmetry groups P. CURIE was the first to point out one of the most important differences between the electric and the magnetic fields, viz. the inseparability of the opposite magnetic poles. A cylindrical magnet has the symmetry ( $\infty$ : m) of a rotating cylinder, but the electric analogy of this magnet, the cylindrical dielectricum which is polarized along its axis, has the symmetry ( $\infty$ . m) of a cone at rest. It is necessary to distinguish between a coverable and a mirrorlike symmetry. The poles of a magnet are equal to each other from the point of view of symmetry, but this is not the case with the poles of a VOLTA column. According to the author's opinion it is the aim of science to compare what has not yet been compared and to differentiate between what has not yet been differentiated, i.e. to find essential and hitherto unknown criteria of equality and difference. Before PIERRE CURIE physicists displayed more interest in the criteria of similarity than in those of the difference between electricity and

SHUBNIKOV, A.V.  
Category : USSR/Solid State Physics - Solid state theory. Geometric crystallography E-2

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 1056

Author : Shubnikov, A.V.

Title : Can Crystals Exist in Nature, Belonging to One Syngony According to Their Symmetry Features, and to Another According to Their Geometric Constants?

Orig Pub : Zap. Vses. mineralog. o-va, 1956, 85, No 1, 108-109

Abstract : Crystals are grouped into syngonies in accordance with two features: symmetry features and the character of their geometric crystal constants  $a$ ,  $b$ , and  $c$ . The author states that it is possible for a crystal to belong to one syngony according to his symmetry features, and to another syngony according to its geometric constants. Certain pseudo-symmetrical (pseudo-rhombic, pseudo-tetragonal, etc.) crystals can be classified in lower syngonies according to their symmetry features than in according to the measured constants. The disagreement between the features may be explained by inaccuracies in measurement and particularly by conditions under which the crystals are formed. In many crystals the coefficients of linear expansion have different signs in different directions. In nature, there may be such crystals, for example, pseudo-tetragonal crystals with rhombic syngony, in which the coefficient of expansion has a

Card : 1/2

SHUBNIKOV, A. V.

Institute of Crystallography, Acad. Sc., Moscow-

"The Splitting of Diphenylamine Crystals Followed by Forming of Spherulites" (Section 14-19) a paper submitted at the General Assembly and International Congress of Crystallography, 10-19 Jul 57, Montreal, Canada.

C-3,800,189

SHUBNIKOV, A.V.

Elementary mechanical phenomena during grinding and polishing  
operations. Trudy Sem. po kach. poverkh. no.3:5-16 '57. (MLRA 10:11)  
(Grinding and polishing)



AUTHOR: Shubnikov, A.V.

70-3-17/20

TITLE: On the formation of spherolites (Ob obrazovanii sferolitov)

PERIODICAL: "Kristallografiya" (Crystallography), 1957, Vol.2, No.3, pp. 424 - 427 (U.S.S.R.)

ABSTRACT: It is shown in the paper that under certain known conditions, formation of the crystalline unit in the form of a spherolite, completely covered with faces of maximum surface energies, can, from the energy point of view, be more favourable than the formation of columnar or lamellar crystals. The conditions of indifference of the crystalline individuum to the lamellar form and to the form of a spherolite are expressed by eqn.(11) and by the graph, Fig. 3; the problem as to whether a lamellar or a spherolite shape is the more favourable from the energy point of view can be solved by the simultaneous solution of the eqns.(3) and (10). If the surface energy of the spherolite formed from a lamellar crystal  $E_s'' > E_k$  (total surface energy of the crystal), the lamellar form will be more stable, whilst for  $E_s'' < E_k$ , the spherolite form will be more stable. The author investigated only the influence of the 2 factors  $v_1$  (speed of growth of the face) and  $\sigma_1$  (specific

Card 1/2

On Nuclear Forms of Spherulites.

70-5-2/31

there is no cavity. If the deviation is great then the cavities may be filled in by spirals. The axial symmetry (hexagonal for example) of the initial nucleus may show itself in the symmetry of the double-mushroom-shaped spherulite. There are 9 figures and 11 references, 6 of which are Slavic.

ASSOCIATION: Institute of Crystallography Ac.Sc.USSR.  
(Institut kristallografi AN SSSR)

SUBMITTED: May 3, 1957.

AVAILABLE: Library of Congress

Card 2/2

SECRET 11/1

AUTHOR: Shubnikov, A.V., Academician 4-11-15/34  
TITLE: Young Friends! (Yunyye druz'ya!)  
PERIODICAL: Znaniye - Sila, 1957, # 11, p 15 (USSR)  
ABSTRACT: The short article deals with the new science of crystallography and explains for what purposes the artificial crystals of the ruby, diamond, quartz, etc. are being used. It states that the research of crystals is directly connected with important problems of biology: the study of the structure of albumins and the elementary processes of life.  
There is 1 figure.  
AVAILABLE: Library of Congress  
Card 1/1

SHUBNIKOV, A.V. (Moskva)

~~Problems~~ related to Ohm's law. Fiz. v shkole 17 no.2:81 Mr-Apr '57.  
(MLRA 10:3)

(Electric resistance--Problems, exercises, etc)

PHASE I BOOK EXPLOITATION

799

Shubnikov, Aleksey Vasileyevich, Academician

Kristally v nauke i tekhnike (Crystals in Science and Technology)  
2nd ed., enl. Moscow, Izd-vo AN SSSR, 1958. 49 p. (Series:  
Akademiya nauk SSSR. Nauchno-populyarnaya seriya) 15,000  
copies printed.

Resp. Ed.: Belov, N.V., Academician.

PURPOSE: The booklet is intended to give the general public an  
idea of the achievements of the Institut kristallografii AN  
SSSR (Institute of Crystallography, AS USSR) in various areas  
of crystallography.

COVERAGE: The booklet deals with the achievements of members of  
the Institute of Crystallography, AS USSR, in the areas of cry-  
stallography given below: Symmetry and antisymmetry: B.K.

Card 1/5

Crystals in Science and Technology

799

Vaynshteyn used antisymmetry to determine the structure of crystals; N.V. Belov, A.M. Zamorzayev, B.A. Tavger and V.H. Zaytsev developed this method. X-ray analysis: Under the direction of N.V. Belov, Ye.N. Belova was first to determine by means of X-ray analysis the structure of tourmaline, and Kh.C. Mamedova those of wallastonite and xonotlite. I.M. Rumanov, N.I. Golovastikov and R.F. Smirnova assisted N.V. Belov in developing the method of x-ray analysis. Structural electronography: Z.G. Pinsker and B.K. Vaynshteyn demonstrated the possibility of using electronography for the determination of crystal structures. Formation of crystals: V.R. Regel' designed a model illustrating the elementary processes accompanying the growth of crystals which are known as dislocations. G.G. Lemmleyn should be considered as one of the initiators of studies on the spiral growth of crystals. Under his guidance, Ye.D. Dukova established the reverse quantitative ratio between the height of spiral steps and the tangential speed of their growth.

Card 2/5

Crystals in Science and Technology

799

Another worker, M.O. Kliya assisted Lemmleyn in his studies on the formation of the so-called balanced form of a crystal. Piezoelectricity: A.S. Shein was the first to obtain piezoelectric structures from Rochelle salt. Description is given of new acoustic radiators designed by A.S. Shein. Seignetteoelectric crystals: M.A. Chernysheva and I.S. Zheludev are mentioned for their studies on the formation and disappearance of domain structures. Method of analyzing clays by means of dyes: The method is based on the studies of N.Ye. Vedeneyeva. Investigations in the field are described in the numerous works of S.V. Grum - Grzhimaylo and N.M. Melankholin. Polaroids: Under the guidance of G.I. Distler, the Institute is developing thermoresistant polaroids capable of withstanding prolonged heating at 120 - 130°C without change of properties. Light filters for astronomic observations: The first Soviet light filter was built by member of Institute A.B. Gil'bert with the assistance of Professor A.B. Severnyy. X-ray Spectographs:

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Crystals in Science and Technology 799

Under the guidance of K.I. Narbutt, E.Ye. Vaynshteyn, A.B. Gil'varg and L.M. Belyayev, the Institute has designed and introduced into a number of establishments new models of x-ray spectographs with concave crystals. Luminescent crystals: Under the guidance of L.M. Belyayev and with participation of B.V. Vitovskiy, G.F. Dobrzhanskiy and P.P. Reznikov, the problem of growing luminiscent crystals from a number of organic and inorganic substances has been solved by the Institute. Synthetic corundum crystals: S.K. Popov, N.Yu. Ikornikova and A.A. Popova are mentioned for their achievements in the manufacture of synthetic rubies. Synthetic quartz crystals: N.N. Sheftal' and V.P. Butuzov have demonstrated the possibility of manufacturing good quality synthetic quartz in industrial quantities. Untwinning of quartz: Ye.V. Tsinslerling has worked out the method of transforming quartz twins into monocrystals. Plasticity and strength of crystals: A.A. Urusova, under the guidance of M.V. Klassen - Neklyudova, is investigating mixed thallium iodide and thallium bromide crystals. In a recent work V.L. Indenbom and G.Ye. Tomilovskiy have apparently succeeded in establishing

Card 4/5



PHASE I BOOK EXPLOITATION 739

Shubnikov, Aleksey Vasil'yevich, Academician

Osnovy opticheskoy kristallografii (Principles of Optical Crystallography) Moscow, Izd-vo AN SSSR, 1958. 204 p.  
4,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut kristallografii.

Ed. of Publishing House: Kuznetsova, Ye.B.; Tech. Ed.:  
Kashina, P.S.

PURPOSE: This book is intended for university students in the field of crystallography, especially the optical properties of crystals.

COVERAGE: This book is devoted to that branch of crystallography which deals with the optical properties of crystals. Its content corresponds to the course in optical crystallography

Card ~~1/10~~

Principles of Optical Crystallography 739

given by the Moscow University Department of Physics. The subjects covered by the author include: the optics of isotropic transparent media, double refraction, light interference in crystal plates, rotation of the plane of polarization, elliptical polarization and elliptical double refraction, conical refraction, and double absorption of light in crystals. Recognition is given to N.M. Melankholin for his careful review of the manuscript and for a series of valuable suggestions. There are no references.

TABLE OF CONTENTS:

The Subject of Optical Crystallography	3
Basic Data From the Optics of Isotropic Transparent Media	4
The laws of reflection and refraction	4
Total internal reflection	5
Dispersion of light	5
Light waves	6
Simplest wave model	7
Refraction of light from the point of view of the wave theory	8

Card 2/10

SHUBNIKOV, A V

AUTHOR: None Given

SOV-26-58-8-34/51

TITLE: Lectures (Delivered) by Soviet Scientists at the Brussels Exhibition (Lektsii sovetskikh uchenykh na Bryussel'skoy vystavke)

PERIODICAL: Priroda, 1958, Nr 8, p 116 (USSR)

ABSTRACT: In August 1958, the greatest Soviet scientists will deliver lectures on the achievements of science in the USSR at the Brussels Fair. In the field of natural sciences the following will lecture: the academicians Semenov, N.N. on Chain Reactions in Chemistry, V.N. Kondrat'yev on Soviet Works on Mass-Spectroscopy, A.P. Vinogradov on the Biochemistry of Isotopes, A.V. Shubnikov on the Growth of Crystals, N.S. Shatskiy on the Tectonic Map of the USSR, A.I. Oparin on the Present State of the Problem on the Origin of Life, Tsitsin, N.V. on Problems of Distant Hybridization, I.V. Tyurin on Soils of the Soviet Union and their Utilization. The following lectures will be delivered by correspondent-members AS USSR N.M. Emanuel' on New Investigations in the Field of Chain Reactions, Andrianov, K.A. on Silicoorganic Compounds, Ye.K. Zavoyskiy on Phenomena of Electron Paramagnetic Resonance, I.M. Frank on the Application of Atomic Energy for Peaceful Purposes, V.I. Popkov on a Unique Ener-

Card 1/2

AUTHOR: Shubnikov, A.V.

70-3-3-1/36

TITLE: The Antisymmetry of Textures (Antisimmetriya tekstur)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 3, pp 263 - 268  
(USSR)

ABSTRACT: Antisymmetrical textures containing axes of infinite order (axes of cylindrical symmetry) can be described by 13 limiting point groups. 5 of these occur in enantiomorphous pairs, that is, exist in right and left forms related to each other by simple reflection in a plane. Two groups show "enantiomorphism of sign", that is, they each exist in two forms which are mutually transformable by reversing the signs of all particles in the textures. There are seven ordinary limiting point groups with  $\infty$  axes:  $\infty$ ,  $\infty.m$ ,  $\infty:2$ ,  $m.\infty$ ,  $\infty/\infty$  and  $\infty/\infty.m$ . Each of the elements  $2, m$  and  $\infty$  is made antisymmetrical in turn (being represented by  $\underline{2}$ ,  $\underline{m}$  and  $\underline{\infty}$ ) and the 20 combinations reduce to 13 when identical pairs are eliminated. The resulting groups are  $\underline{\infty}$  (left and right),  $\underline{\infty.m}$  (+ and -),  $\underline{\infty:2}$  (l and r),  $\underline{\infty:2}$  (l and r),  $\underline{\infty:2}$  (l and r),  $\underline{m.\infty}$  (+ and -),  $\underline{\infty/\infty}$  (l and r),  $\underline{\infty/\infty.m}$  (+ and -),  $\underline{\infty/\infty}$  (l and r),  $\underline{\infty/\infty.m}$  (+ and -),  $\underline{\infty/\infty}$  (l and r),  $\underline{\infty/\infty.m}$  (+ and -),  $\underline{\infty/\infty}$  (l and r),  $\underline{\infty/\infty.m}$  (+ and -).

Diagrams representing these groups are reproduced but examples Card1/2 of the real textures are not discussed.

The Antisymmetry of Textures

70-3-3-1/36

There are 4 figures and 4 Soviet references.

ASSOCIATION: Institut kristallografii AN SSSR  
(Institute of Crystallography, Ac. Sc. USSR)

SUBMITTED: February 3, 1958.

Card 2/2

AUTHOR: Shubnikov, A.V.

SOV/70-3-4-17/26

TITLE: Rhythmic Growth of Spherulites of Triphenylmethane  
(Ritmicheskiy rost sferolitov trifenilmetana)

PERIODICAL: Kristallografiya, 1958, Vol 3, nr 4, pp 499-501 (USSR)

ABSTRACT: If triphenylmethane containing 10-15% rosin is melted on a microscope slide (m.p. 92.5 °C) and one drop is transferred on a needle point to a metal plate and the drop is cooled as rapidly as possible with an air jet, then spherulitic growth of the triphenylmethane can be observed with a microscope. Both rings and spirals are observed. The rings arise from rectilinear "waves" oscillating in the surface of the spherulite. These waves spread from points far from the limits of the growing spherulite and in the process of growth the spherulite itself bends these waves into circles. The waves are not visible in polarised light between crossed Nicols. That these waves are really waves of freezing can be confirmed by the sharp system of waves seen both when the microscope is focused on the troughs and on the crests. Each component of the

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Rhythmic Growth of Spherulites of Triphenylmethane SOV/70-3-4-17/26

waves is seen to act like a cylindrical lens. The reasons for the formation of the waves remains obscure. There are 4 figures and 4 references, 3 of which are German and 1 English.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of Crystallography of the Ac.Sc.USSR)

SUBMITTED: May 12, 1958

Card 2/2

AUTHOR: Shubnikov, A.V.

SOV/70-3-4-26/26

TITLE: ~~The Own (defined)~~ Symmetry of Atoms and Molecules in a  
Crystal (O sobstvennoy simmetrii atomov i molekul  
v kristalle)

PERIODICAL: Kristallografiya, 1958, Vol 3, nr 4, pp 521 - 524 (USSR)

ABSTRACT: Illustrations are given to bring out the differences between the "own symmetry" of an atom, chemical group, crystal or biological structure and its "forced symmetry". The former is the symmetry which the object has of itself in isolation from all disturbing influences such as force fields due to its surroundings. It is to some extent an idealisation as these conditions can never be achieved in practice although the means used for detecting the symmetry may be insensitive to the disturbing elements. For example, the crystal symmetry as shown by X-ray photographs is generally examined in a gravity field which will reduce the symmetry of the whole arrangement. The difference from the ideal is, however, almost always negligible when due to this cause. X-ray methods show the symmetry of the electron cloud and not that of the whole structure. Neutron diffraction may detect lowered

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SOV/70-3-4-26/26

The Own [defined] Symmetry of Atoms and Molecules in a Crystal

symmetry in the arrangement of the electron spins to which the X-ray method is indifferent. The "forced symmetry" is the actual symmetry of the object considering the external conditions and its surrounding which distort it from the "own" symmetry. In practice, the case of true "own symmetry" never really occurs but, as this is obviously a useful concept, it continues to be used. The confusion is generally a purely verbal one and in actual experimental work little difficulty occurs. There are 2 figures and 5 references, 2 of which are German, 2 English and 1 Soviet.

ASSOCIATION: Institut kristallografii AN SSSR  
(Institute of Crystallography Ac.Sc. USSR)

SUBMITTED: May 21, 1958

Card 2/2

SHUBNIKOV, A. V., PARVOV, V. F.

"The Formation of Crystals"

a report presented at Symposium of the International Union of Crystallography,  
Leningrad, 21 - 27 May 1959.

AUTHOR: Shubnikov, A.V.

SOV/70-4-3-1/32

TITLE: The Symmetry and Antisymmetry of Rods and Semi-continua with Principal Axes of Infinite Order Along Which There are Finite Translations

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 3, pp 279 - 285 (USSR)

ABSTRACT: The 25 symmetry and antisymmetry groups which describe rods and semi-continua are tabulated. There are seven grey, seven one-coloured and eleven black and white groups. The groups of the corresponding layered semi-continua are obtained by combining the rod groups with the groups of possible translations in directions perpendicular to the main axis of the rod. The symmetry of objects having a sign (+ or -) and a hand (d or l) has been examined earlier but the restricted case of rods and semi-continua is of interest for describing textures. The following groups apply to rods:  $(\infty)\tau$ ;  $(\infty)\bar{\tau}$ ;  $(\infty . m)\tau$ ;  $(\infty : m)\tau$ ;  $(\infty : m)\bar{\tau}$ ;  $(\infty : 2)\tau$ ;  $(m . \infty : m)\tau$  where  $\infty$  is an axis of infinite order,  $m$  a plane of symmetry,  $\tau$  an axis of finite translations,  $\bar{\tau}$  a mirror axis of translations, a dot is a sign of parallelism and a colon

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SOV/70-4-3-1/32

The Symmetry and Antisymmetry of Rods and Semi-continua With Principal Axes of Infinite Order Along Which There are Finite Translations

a sign of perpendicularity. These are the seven one-coloured groups. These are now combined with the  $\pi$  and  $(d, l)$  operations. Each of the 7 can be  $+$  or  $-$  and  $(\infty)\tau$  and  $(\infty:2)\tau$  can also be  $d$  or  $l$ . Of the 18 groups, those from  $(\infty)\tau$ ,  $(\infty)\tau$ ,  $(\infty, m)\tau$  can be said to be single-layered, those from  $(\infty:m)\tau$  double-layered, those from  $(\infty:m)\tau$  four-layered and the remainder double-layered. The grey groups are  $(\infty)\tau$  ( $d$  and  $l$ );  $(\infty)\tau$ ;  $(\infty, m)\tau$ ;  $(\infty:m)\tau$ ;  $(\infty:2)\tau$  ( $d$  and  $l$ );  $(m, \infty:m)\tau$ ; where  $\infty$  is the anti-axis. The black and white groups are obtained by substituting the operations  $\pi$ ,  $\tau$  and  $\tau$  for  $m$ ,  $\tau$  and  $\tau$  and excluding groups which are generated more than once. The operation  $\pi$  reflects the object in the plane and changes it from white to black or vice versa. There are the groups  $(\infty)\tau$

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SOV/70-4-3-1/32

The Symmetry and Antisymmetry of Rods and Semi-continua with Principal Axes of Infinite Order Along Which There are Finite Translations

$(1 \text{ and } d); (\infty)\bar{\tau} (+ \text{ and } -); (\infty, m)\tau; (\infty:m)\tau$   
 $(+ \text{ and } -); (\infty:m)\tau; (\infty : m)\bar{\tau}; (\infty : m)\bar{\tau};$   
 $(\infty : m)\bar{\tau} (+ \text{ and } -); (\infty : 2)\tau (1 \text{ and } d); (\infty : 2)\bar{\tau}$   
 $(1 \text{ and } d); (m \cdot \infty : m)\tau; (m \cdot \infty : m)\tau .$

There are 5 figures and 9 references, of which 5 are Soviet and 4 German.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of Crystallography of the Ac.Sc., USSR)

SUBMITTED: December 29, 1958

Card 3/3

SOV/70-4-3-2/32

AUTHOR: Shubnikov, A.V.

TITLE: The Full Systematics of the Point Groups of Symmetry

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 3, pp 286-288 (USSR)

ABSTRACT: The three-dimensional point groups are set out in categories as:  
 First category -  $N$  ( $N = 1, 2, \dots, \infty$ );  $N:2$  ( $N = 1, 2, \dots, \infty$ );  $3/2, 3/4, 3/5$  and  $\infty/\infty$ . Second category -  $N.m$  ( $N = 1, 2, \dots, \infty$ );  $N:m$  ( $N = 1, 2, \dots, \infty$ ) and  $\bar{N}$  ( $N = 2, 4, \dots, \infty$ , even integers only);  $m.N:m$  ( $N = 1, 2, \dots, \infty$ ) and  $\bar{N}.m$  ( $N = 2, 4, \dots, \infty$ , even integers only);  $6/2, 3/4, 6/4, 3/10, \infty/\infty.m$ .  
 Only essential generating elements of symmetry enter into the group designations.  $N$  denotes a simple axis of symmetry of order  $N$  and  $\bar{N}$  an inversion axis.  $m$  is a mirror plane of symmetry. A dot between two elements denotes their parallelism and a colon their perpendicularity. An oblique stroke indicates an oblique inclination. The first category contains only first-order (proper) operations; the second category contains both first- and second-order

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78092  
SOV/70-5-1-1/30

AUTHOR: Srubnikov, A. V.

TITLE: Prospects of the Development of Crystallography  
in the Light of Decisions of the 21st Congress  
of the Communist Party of the Soviet Union

PERIODICAL: Kristallografiya, 1960, Vol 5, Nr 1, pp 3-14 (USSR)

ABSTRACT: Since the Congress decisions mention the necessity of  
the development of solid state physics and chemistry  
of high polymers, both subject to the laws of structure  
transformations, the author believes that crystallographers  
occupying a transitional field between chemistry and  
physics should investigate the following: (1) the laws  
controlling crystallization; (2) the laws of atomic  
and molecular structures and the dependence of  
properties on structure, (3) the laws that govern  
interaction between the matter of a crystal and  
environment, and (4, production and structure of  
the crystals needed for modern instruments. A number  
of specific problems of the four subjects are discussed.

Card 1/2

SHUBNIKOV, A.V.

Time inversion as an antisymmetry operation. Kristallografiia 5  
no.2:328-333 Mr-Apr '60. (MIRA 13:9)

1. Institut kristallografii AN SSSR.  
(Crystallography)



S/070/60/005/004/001/012  
E132/E360

AUTHOR: Shubnikov, A.V.

TITLE: The Symmetry of Similarity (Preliminary Communication)

PERIODICAL: Kristallografiya, 1960, Vol. 5, No. 4,  
pp. 489 - 496

TEXT: The study of sequences of similar figures where a steady magnification or diminution takes place has a very long history. The golden section has received particular attention and the phenomena of phyllotaxis have long attracted mathematicians. The possibility of the mathematical treatment of similarity was suggested by H. Weyl ("Symmetry", 1952). Figures of the same form but of different sizes are related by similarity operations. The operation  $K$  translated an object through a distance  $n$  times the previous translation and magnifies it  $n$  times. It follows that there is a special vanishing point through which all straight lines joining corresponding points of each object pass. The operation  $L$  gives successive rotations of the figure about a fixed axis through an angle  $\varphi$  followed by the operation  $K$ .  $\varphi$  may be rationally or irrationally related to  $2\pi$ . Here corresponding points will lie on a logarithmic spiral. When  $\varphi = 2\pi$ , then

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S/070/60/005/004/001/012  
E132/E360

The Symmetry of Similarity (Preliminary Communication)

$L = K$ . The operation  $M$  provides a mirror reflection in a plane of similarity thus giving two series of objects, each generated by  $K$  operations, one on each side of the similarity plane. The operation  $N$  produces three dimensional figures and can be regarded as the product of the operations  $K$  and  $L$  acting in perpendicular directions. Examples of these operations are illustrated. These various operations can be combined into similarity symmetry groups by adding ordinary symmetry operations to the above. A number of these groups, which are essentially plane point groups, are listed. Besides applications in art and architecture the theory has obvious importance for the morphological description of living organisms. The rhythmic phenomena of crystal growth may also be susceptible to this sort of description. B

There are 20 figures and 9 references: 2 Soviet, 5 English, 1 French and 1 German.

Card 2/3

S/070/60/005/004/016/016/XX  
E132/E460

AUTHOR: Shubnikov, A.V.

TITLE: On the Determination of the Sign of the Enantiomorphism  
of Piezoelectric Textures

PERIODICAL: Kristallografiya, 1960, Vol.5, No.4, pp.644-645

TEXT: Of those textures which have an axis of infinite order only those which have an axis of symmetry, namely  $\infty$ ,  $\infty:2$  and  $\infty/\infty$ , can be enantiomorphous. A rule has been found experimentally for telling right-handed textures of Rochelle salt from left. This shows that enantiomorphous textures of the class  $\infty:2$  can be distinguished with only one piezoelectric experiment. The knowledge can then be used for solving several problems connected with the dissymmetry of living matter. It has been shown earlier that wood has the texture symmetry  $\infty:2$  and that it obeys the opposite rule to that followed by Rochelle salt. V.A.Bazhenov (Ref.4) has studied some 1100 specimens of many kinds of wood and has found no exception to the rule that all wood belongs to the left-handed enantiomorphous modification. He associates this with the presence of cellulose in all woods. It does not follow that the occurrence of the right-handed form is

Card 1/2

SHUBNIKOV, A.V.

Symmetry of similarity. Kristallografiia 5 no.5:489-496 J1-Ag '60.  
(MIRA 13:9)

1. Institut kristallografii AN SSSR.  
(Symmetry)

SHUBNIKOV, Aleksey Vasil'yevich, akad.; IOFFE, V.G., red. izd-va; ROMANOV,  
G.N., tekhn. red.

[Problem of the dissymmetry of material objects] Problema dissem-  
etrii material'nykh ob"ektov. Moskva, Izd-vo Akad. nauk SSSR,  
1961. 54 p. (MIRA 14:11)  
(Symmetry)

SHUBNIKOV, A.V.

Reciprocally parallel arrangement of the dendrites of ammonium chloride in a drop of solution. Kristallografiia 6 no.2:244-248  
Mr-Ap '61. (MIRA 14:9)

1. Institut kristallografii AN SSSR.  
(Ammonium chloride crystals)

SHUBNIKOV, A.V.

Symmetry and physical properties of cones of growth. Kristallografiia  
6 no.3:319-322 My-Je '61. (MIRA 14:8)

1. Institut kristallografii AN SSSR.  
(Crystals--Growth)

SHUBNIKOV, A.V.; PARVOV, V.F.

Generation of crystallization centers in a drop of ammonium  
chloride solution under the action of an electric field.  
Kristallografiia 6 no.3:443-450 My-Je '61... (MIRA 14:8)

1. Institut kristallografii AN SSSR.  
(Ammonium chloride) (Electric fields)  
(Crystallization)



SHUBNIKOV, A.V.

Complete systematics of the black-white point groups. *Kristallografiia*  
6 no.4:490-495 J1-Ag '61. (MIRA 14:8)

1. Institut kristallografii AN SSSR.  
(Crystallography)

KAPUSTIN, Aleksandr Pavlovich; ~~LEMLEYN~~, G.G., prof., retsenzent;  
KUDRYAVTSEV, B.B., prof., retsenzent; SBITNIKOVA, I.S., red.  
izd-va; SHUBENIKOV, A.V., akademik, otv. red.; SIMKINA, G.S., tekhn. red.

[Effect of ultrasound on the kinetics of crystallization]  
Vliianie ul'trazvuka na kinetiku kristallizatsii. Moskva,  
Izd-vo Akad. nauk SSSR, 1962. 106 p. (MIRA 15:3)  
(Ultrasonic waves) (Crystals--Growth)

GAYUI, Rene Zhyust [Hauy, Rene-Just]; SHAFRANOVSKIY, I.I., prof.;  
ZABOTKINA, O.S. [translator]; STRATANOVSKIY, G.A. [translator];  
SHUBNIKOV, A.V., akademik, red.; BOKIY, G.B., red.;  
PETROVSKIY, I.G., akademik, red.; ANDREYEV, N.N., akademik, red.;  
KAZANSKIY, B.A., akademik, red.; YUDIN, P.F., akademik, red.;  
DELONE, B.N., red.; SAMARIN, A.M., red.; ZUBOV, V.P., prof., red.;  
LEEDEV, D.M., prof., red.; FIGUROVSKIY, N.A., prof., red.;  
KUZNETSOV, I.V., kand. filos. nauk, red.; OZNOBISHIN, D.V., kand.  
istor. nauk, red.; SUSHKOVA, T.I., red. izd-va; SMIRNOVA, A.V.,  
tekh. red.

[Structure of crystals; selected works] Struktura kristallov;  
izbrannye trudy. Sostavlenie, stat'ia i primechania I.I.  
Shafranovskogo. Redaktsia A.V. Shubnikova i G.B. Bokiia. Mo-  
skva, Izd-vo Akad. nauk SSSR, 1962. 175 p. Translated from the  
French. (MIRA 15:3)

1. Chlen-korrespondent Akademii nauk SSSR (for Boki, Delone,  
Samarin).

(Crystallography)

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Z/037/62/000/002/012/015

E073/E535

9.2180

AUTHOR: Shubnikov, A.V.

TITLE: Piezo-electric textures and the prospects of further development of piezo-electricity

PERIODICAL: Československý časopis pro fysiku, no.2, 1962, 172-174

TEXT: Of the infinite number of textures of the general type, textures with symmetry axes are of interest in piezo-electric studies. These textures can be sub-divided into seven symmetry groups, of which three may prove to have piezo-electric properties. These three piezo-electric symmetry groups are designated  $\infty$ ,  $\infty.m$  and  $\infty:2$ . Of practical importance are primarily the piezo-electric textures made of Rochelle salt and barium titanate and a brief description of the manufacture of these is given. The author anticipates the emergence of a number of new textures, since theoretically piezo-electric textures with any crystallographic or non-crystallographic symmetry may exist. Recently, a piezo-electric phenomenon was observed in a certain type of perspex during its deformation; this texture consists basically of long molecules in a regular arrangement. The author predicts that

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S/070/62/007/001/001/022  
E132/E460

AUTHOR: Shubnikov, A.V.

TITLE: The groups (classes) of symmetry and antisymmetry of  
finite strips

PERIODICAL: Kristallografiya, v.7, no.1, 1962, 3-6

TEXT: The possible symmetries of long plates are considered. The thickness of these plates is infinitely small but each side may have a figure in low relief on it. All the groups are subgroups of the orthorhombic group mmm. There are 16 groups of ordinary symmetry and a further 35 if black and white symmetry is considered. Because of the distinction between the three axes of the band there may be three groups with symmetry  $m$  with the plane perpendicular to the three axes in turn; this increases the total from 8 to 16 and correspondingly for the black and white groups.

ASSOCIATION: Institut kristallografii AN SSSR  
(Institute of Crystallography AS USSR)

SUBMITTED: October 23, 1961  
Card 1/1

SHUBNIKOV, A.V.

Black-white groups of infinite bands. Kristallografiia 7 no.2:  
186-191 Mr-Apr '62. (MIRA 15:4)

1. Institut kristallografii AN SSSR.  
(Crystallography)

SHUBNIKOV, A. V.

Classing all crystallographic symmetry groups as three-dimensional groups. Kristallografiia 7 no.3:490-495  
My-Je '62. (MIRA 16:1)

1. Institut kristallografi AN SSSR.

(Crystallography)

SHUBNIKOV, A. V.

SUBNIKOV, A. V.

Piezoelectric textures and the outlook for development of piezoelectricity. Cs cas fys 12 no. 2:172-174. '62.

1. Ustav krystalografie Akademie ved S. S. S. R.



SHUBNIKOV, A.V., akademik

Swimming magnets and swimming crystals. Priroda 51 no.3:17-22  
Mr '62. (MIRA 15:3)  
(Crystals—Growth) (Magnets)

SHUENIKOV, A.V.

Incompleteness of the "unified system of crystallographic groups."  
Kristallografiia 8 no.1:131-132 Ja-F'63 (MIRA 17:7)

1. Institut kristallografii AN SSSR.

SHUBNIKOV, A.V.

What information is contained in a regular system of points?  
Kristallografiia 8 no.6:943-944 N-D'63. (MIRA 17:2)

1. Institut kristallografii AN SSSR.

PARVOV, V.F.; SHUBNIKOV, A.V.

Zero growth velocity faces in  $K_2Cr_2O_7$ . Kristallografiia 9  
no.3:435-436 My-Je '64. (MIRA 17:6)

1. Institut kristallografi AN SSSR.

SHUBNIKOV, A.V., akademik

Globular model of the structure of crystals and amorphous  
bodies. Priroda 53 no.10:77-80 '64. (MIRA 17:11)

1. Institut kristallografii AN SSSR, Moskva.

L 22538-65 EWT(m)/EPF(n)-2/EWP(t)/EWP(b) Pu-4 IJP(c) ES/WW/JD/JO

ACCESSION NR: AP4042794

S/0020/64/157/003/0583/0585

AUTHOR: Dy\*mkov, Yu. M.; Shubnikov, A. V.

TITLE: On the epitaxial transformation of  $\text{U}_3\text{O}_8 \rightarrow \text{UO}_{2+x}$  in uranites

SOURCE: AN SSSR. Doklady\*, v. 157, no. 3, 1964, 583-585

TOPIC TAGS: epitaxial transformation, uranite, crystallography, uraninite, uranium compound

ABSTRACT: It has been suggested (R. M. Berman, Am. Mineral, 42, 705 (1957)) that the uranite was first precipitated as  $\text{U}_3\text{O}_8$ , and then transformed into  $\text{UO}_{2+x}$ . The author finds support for this suggestion in the microscopic analysis of etched uranites. The suggested transformation permits a distinct separation of uranite from uraninite. While the first was precipitated as a noncubic mineral  $\text{U}_3\text{O}_8$  (and possibly as  $\text{U}_2\text{O}_5$ ), and then in steps transformed into  $\text{UO}_{2+x}$ , the latter crystallized as a cubic mineral  $\text{U}_4\text{O}_9 \rightarrow \text{UO}_{2+x}$  or  $\text{UO}_2$ . Orig. art. has: 2 figures

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L 22538-65

ACCESSION NR: AP4042794

ASSOCIATION: None

SUBMITTED: 10Nov63

ENCL: 00

SUB CODE: IC, SS

NO REF SOV: 004

OTHER013

Card 2/2

SHUBNIKOV, A.V., akademik

Symmetry of the molecules of benzene and related compounds.  
Dokl. AN SSSR 157 no.3:586-588 Jl '64. (MIRA 17:7)

1. Institut Kristallografi AN SSSR.



BAZAROV, I.P.; GERASIMOV, Ya.I.; KISELEV, A.V.; PREDVODITELEV, A.S.;  
RADUSHKEVICH, L.V.; SKURATOV, S.M.; TERLETSKIY, N.P.; CHMUTOV,  
K.V.; SHUBNIKOV, A.V.; SHULEYKIN, V.V.

Vladimir Ksenofontovich Semenchenko, 1894- ; on his 70th  
birthday. Zhur. fiz. khim. 39 no.5:1300-1301 My '65.

(MIRA 18:8)

SHUBNIKOV, A.V., akademik

Raster model of ordinary and group waves. Izvestia 54 no.11:  
61-67 '65. (MIRA 18:11)

1. Institut kristallografii AN SSSR, Moskva.

SHUBNIKOV, A.V.

On the so-called complete symmetry; review of I.S. Zheludev's  
article. Kristallografiia 9 no.4:587-588 J1-Ag '64.

(MIRA 17:11)

1. Institut kristallografii AN SSSR.

SHUBNIKOV, D.A.

Different reaction to electric light in male and female individuals  
of *Clupeonella engrauliformis* (Borodin). Zool.zhur. 38 no.5:781-782  
My '59. (MIRA 12:7)

1. All-Union Research Institute of Marine Fisheries and Oceanography,  
Moscow.  
(Caspian Sea--Herring) (Light--Physiological effect)